dx.doi.org/10.5380/ce.v27i0.82798

Cogitare Enferm. 2022, v27:e82798

Cogitare Enfermagem

ORIGINAL ARTICLE

EPIDEMIOLOGICAL PROFILE OF CHILDREN INFECTED BY THE NEW CORONAVIRUS: CROSS-SECTIONAL STUDY

Dayvanne Pereira Soares da Silva Damasceno[1]
Aline Cerqueira Santos Santana da Silva[1]
Luciana Fernandes Portela[2]
Fernanda Garcia Bezerra Góes[1]
Elena Araujo Martinez[3]
Gisele de Lima Neves[1]

ABSTRACT

Objective: to describe the epidemiological profile of children infected by the new coronavirus from the notifications of cases to the Ministry of Health. Method: epidemiological, cross-sectional, and descriptive study, carried out through the notifications in the Epidemiological Surveillance Information System of Influenza from the first to the twentieth epidemiological week of 2021. Notifications from children aged zero to nine years were included. Variables were analyzed using bivariate analysis and multivariate logistic regression. Results: 3,041 cases were notified, among which 414 (13.6%) confirmed the diagnosis of COVID-19. Children between six and nine years old were 1.33 times more likely to develop COVID-19 and be admitted to the intensive care unit (CR=1.46; CI: 1.12-1.87) and had a greater chance (CR=3.30; CI: 1.92-5.66) of dying. Conclusion: the findings contribute to guide and modulate interventions aimed at mitigating transmission and control of aggravations about COVID-19 in children.

DESCRIPTORS: Child; Coronavirus Infections; Child Health; Epidemiology; Pandemics.

HOW TO REFERENCE THIS ARTICLE:
Damasceno DPS da S, Silva ACSS da, Portela LF, Góes FGB, Martinez EA, Neves G de L. Epidemiological profile of children infected by the new coronavirus: cross-sectional study. Cogitare Enferm. [Internet]. 2022 [accessed "insert day, monh and year"]; 27. Available from: http://dx.doi.org/10.5380/ce.v27i0.82798.

[1]Universidade Federal Fluminense. Rio das Ostras, RJ, Brasil.
[2]Instituto Nacional de Infectologia Evandro Chagas. Rio de Janeiro, RJ, Brasil.
[3]Instituto Nacional Fernandes Figueira. Rio de Janeiro, RJ, Brasil.

INTRODUCTION

On December 31, 2019, in Wuhan, China, a new type of coronavirus was detected, Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) which is related to more severe acute respiratory syndrome (SARS), setting the most serious public health problem in the world so far, with rapid transmission among humans, leading to numerous health, economic and political implications[1].

In the light of the current knowledge, it is known that COVID-19 expresses a multi-systemic involvement and may manifest in adults, young people, the elderly, patients with comorbidities and, with a lower incidence, in children[2]. One of the most striking and consistent findings among the reports developed worldwide about this disease is that, in contrast to infected adults, children present a lower incidence of the disease, rarely present severe forms, besides a lower rate of complications and deaths, and, when infected, they almost always configure asymptomatic, mild, or moderate cases[3].

With this, some hypotheses were formulated as the Brazilian Society of Pediatrics (SBP), when it points out that inflammatory cytokines contribute to viral sepsis and, as the cellular and humoral immune system in children is less developed, the inflammatory response is less exacerbated, hindering the development of the disease and consequently of more severe cases. However, it warns that in this population segment, one must consider children under two years of age and the group of children with comorbidities, who are at high risk of developing more severe cases of COVID-19[4].

Thus, the clinical picture in children can vary between mild, moderate, severe, or critical. The mild presentation presents nonspecific symptoms of upper airway involvement, or even gastrointestinal symptoms, as opposed to the moderate presentation, which affects the lower respiratory system, but without signs of severity. On the other hand, severe cases usually evolve to severe pneumonia, accompanied by cough or difficulty breathing, and other signs such as unconsciousness and convulsion. On the other hand, the critical condition develops SARS with oxygenation impairment[5].

In some cases, the involvement and dysfunction of other organs can be considered, configuring imminent risk of death. There are also recent reports on multi-systemic inflammatory syndrome, with clinical manifestations and alterations in complementary tests like those observed in children and adolescents with Kawasaki syndrome, incomplete Kawasaki and/or toxic shock syndrome[6]. However, there are still several questions regarding the disease manifestations and its repercussions in the pediatric patient[7].

Despite preliminary scientific evidence reporting that children have a milder clinical picture of COVID-19, more recent research points to the possibility of complications that would lead to worsening of the disease, as shown in the fourth phase of the largest epidemiological study produced on coronavirus in Brazil - "Epicovid-BR", which proved a proportional increase in infection in children and the elderly, with a consequent decrease among adults, who were initially the most affected. Research has shown high prevalence in Brazilian children, differing from what has been reported in other places, such as European countries and China[8].

In addition to the change in the age profile and clinical manifestations, other factors seem to interfere in the aggregate data against the pediatric population, for example, the number of reports of cases of COVID-19, which probably underestimate the true number of infected persons. This underestimation is due to the widespread unavailability of tests, in addition to the significant proportion of people who, despite being infected, develop the asymptomatic or mild form and, for this factor, are not diagnosed, especially children[9].

Despite the continuous efforts engendered by the national and international scientific community about COVID-19, several questions remain, such as the broad clinical and

heterogeneous spectrum, the different manifestations of the disease and its repercussions in the pediatric patient, together with the inconsistency of available information about the severity and comorbidities in children, generating a global impact caused by the new coronavirus, with an increase in the number of cases and deaths even among children[10].

Thus, this study is justified by the need to understand how the disease affects this age group and what the convergent factors in its infection are, since available data on the manifestations and repercussions of COVID-19 in pediatric patients are still incipient. Thus, it was necessary to investigate which is the epidemiological profile of children infected by the new coronavirus, to understand and, consequently, to enable information at different levels of health care and for the population, aiming to reduce the rates of transmission, complications, hospitalizations, and deaths from this disease. Thus, the study proposes to describe the epidemiological profile of children infected by the new coronavirus from the notifications of cases to the Ministry of Health of Brazil.

METHOD

Epidemiological, cross-sectional, descriptive study, carried out with secondary data from cases reported and made available by the Influenza Epidemiological Surveillance Information System (SIVEP-Gripe). The research description was guided by the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE)[11] guidelines.

We considered all notifications of children aged zero to nine years old, available in the SIVEP-Gripe system during the period of data collection, which comprised from the first to the twentieth epidemiological week of the year 2021, corresponding to the period from January 3 to May 22, 2021, being these the inclusion criteria. This study considered the definition of child as a person in the age group zero to nine years old, as postulated in the National Policy for Comprehensive Care of Child Health[12]. It is noteworthy that, facing the period of data collection, 65,535 notifications were recorded, of these only 3,041 were children aged zero to nine years old.

Thus, all demographic and clinical variables that were potentially associated with severe acute respiratory syndromes and had less than 25% missing data been investigated to control for potential information bias. The variables studied are described in Chart 1.

Chart 1- Distribution of variables analyzed according to description in the data dictionary. Rio de Janeiro, RJ, Brazil, 2021 (continua)

Variable's name	Categorization	Variable Description	Analysis
Age	0-5 years old; 6-9 years old.	Age reported by the patient	Pearson chi-square test; Odds ratio (95% CI) and Multivariate logistic regression
Gender	Female; Male	Patient gender	Pearson's chi-square test; odds ratio (95% CI).
Skin Color	White; Black; Brown (yellow and indigenous races were excluded from the analysis).	Patient's self-declared color or race	Pearson's chi-square test; odds ratio (95% CI).
Notification Area	Urban; Rural; Peri-urban.	Geographic area of the patient's home address	Pearson's chi-square test; Chance ration (95% CI) and multivariate logistic regression.

Notification Region	North; Northeast; South; Midwest; Southeast.	Region of the country	Pearson's chi-square test; odds ratio (95% CI).
There was an admission	Yes, No	Has the patient been hospitalized?	Pearson chi-square test; Odds ratio (95% CI).
Admitted to ICU	Yes, No.	Was the patient admitted to the ICU?	Pearson chi-square test; Odds ratio (95% CI) and Multivariate logistic regression.
Use of ventilatory support	Yes, No.	Did the patient use ventilatory support?	Pearson chi-square test; Odds ratio (95% CI).
Normal x-ray	Yes, No	Inform chest x-ray results	Pearson chi-square test; Odds ratio (95% CI).
Evolution	Cure; Death.	Evolution of the case	Pearson chi-square test; Odds ratio (95% CI) and Multivariate logistic regression.
Signs and symptoms: Fever; Cough; Sore throat; Dyspnea	Yes, No (for all signs and symptoms).	Did the patient have any of the listed signs and symptoms?	Pearson's chi-square test; odds ratio (95% CI) and multivariate logistic regression.
Respiratory distress; O2 saturation < 95%.	Yes, No (for all signs and symptoms).	Did the patient have any of the listed signs and symptoms?	Pearson's chi-square test; odds ratio (95% CI).

Source: Influenza Epidemiological Surveillance Information System (SIVEP/Gripe) data dictionary, 2021.

It is noteworthy that, for the purpose of the analyses, all children who tested positive for RT-PCR or whose final clinical diagnosis identified the presence of COVID-19 were considered as COVID-19 cases.

The analyses were based on the hierarchical multivariate model. This analysis consisted of first developing bivariate analyses where the association between factors possibly associated with the diagnosis of COVID19 was tested. Thus, the association between sociodemographic variables and clinical factors and the diagnosis of COVID-19 was tested. Since all variables were of the nominal qualitative type, Pearson's chi-square test was used in conducting the bivariate analyses.

After concluding the bivariate analyses, all variables that presented statistical significance in this analysis with $p \leq 0.20$ were listed for the multivariate model. Thus, the variables selected for the multivariate model were hierarchized in three blocks of determinants: block I (sociodemographic variables: age and region of notification), block II (clinical factors - associated symptoms: fever, cough, sore throat, dyspnea), and block III (clinical factors - hospital: ICU admission and evolution).

Finally, multivariate logistic regression was conducted according to the hierarchical model of variable entry based on the Odds Ratio (CR) and 95% Confidence Interval (CI). In this model, variables are adjusted for each other, respecting the degree of proximity to the outcome. Thus, the first level of adjustment adopted was composed of the variables in block I (distal level); the second level of adjustment adopted was block II (intermediate level) and, finally, block III (proximal level).

It should be noted that the variables "reporting region", "hospitalization" and "respiratory distress" were not included in the multivariate model because they were collinear in relation to the variables "reporting zone", "ICU admission" and "dyspnea", respectively. Data were made available by the SIVEP-Gripe system in Microsoft Excel® spreadsheets, then exported and analyzed in the Statistical Package for the Social Sciences

SPSS version 23.

The data survey in SIVEP-Gripe was carried out by two different researchers, with double-checking of the selected variables, allowing the comparison between the findings and the final casting of the variables that would compose the study.

The data used are in the public domain and are available on the website of the Informatics Department of the Single Health System (SUS)- https://opendatasus.saude.gov.br/dataset/bd-srag-2021 and were accessed in June 2021. Since this is a study based on secondary data, it complies with Resolution No. 510 of April 7, 2016, of the National Health Council.

RESULTS

In Brazil, 3,041 cases of children aged zero to nine years old were notified in SIVEP-Gripe from the first to the 20th epidemiological week of 2021. The group was composed of 1,733 (57%) male children; with the highest prevalence of brown children 1,340 (44.1%) and the lowest rate of notification among indigenous children 16 (0.5%). The most prevalent age group was children between zero and five years of age 2,364 (77.7%). Regarding the region of notification, the Southeast had the highest frequency of notifications 1,535 (50.5%). The urban area had the highest number of notifications 2,454 (80.7%). Of the total number of notifications, 636 (20.9%) children required admission to the Intensive Care Unit (ICU) and 2,903 (95.5%) children required admission to clinical units. Regarding the evolution, 60 (2%) children died and, of the total cases analyzed, 414 (13.6%) children had the diagnosis confirmed for COVID-19 (Table 1).

Table 1 - Characterization of the population according to the variables studied. Rio de Janeiro, RJ, Brazil, 2021 (continues)

Characteristics studied	n (%)
Gender	
Female	1304 (42,9)
Male	1733(57)
Missing data	4 (0,1)
Age	
0 to 5 years old	677 (22,30
6 to 9 years old	2364 (77,7)
Skin Color	
White	938 (30,8)
Blacks	98 (3,2)
Browns	1340 (44,1)
Indigenous	16 (0,5)
Yellow	21 (0,7)
Missing Data	628 (20,7)
Notification Area	

Urban	2454 (92,5)
Rural	139 (5,2)
Peri-urban	60 (2,3)
Missing data	388 (12,8)
Reporting Region	
Southeast	1535 (5,5)
North	218 (7,2)
Northeast	712 (23,4))
South	343 (11,3)
Center-West	233 (2,7)
There was admission	
No	49 (1,6)
Yes	2903 (95,5)
Missing data	89 (2,9)
Admitted to ICU	
No	1890 (62,2)
Yes	636 (20,9)
Missing data	515 (16,9)
Normal X-ray	
Yes	334 (23,5)
No	880 (62)
Missing data	206 (14,5)
Use of ventilatory support	
No	1015 (33,4)
Yes	1435 (47,2)
Missing data	591 (19,4)
Saturation <95%	
No	959 (40,9)
Yes	1353 (57,7)
Missing Data	34 (1,4)
Fever	
No	676 (22,2)
Yes	1938 (63,8)
Missing data	427 (14)
Cough	
No	478 (15,7)
Yes	2241 (73,7)
Missing data	322 (10,6)
Sore throat	

No	1961 (64,5)
Yes	293 (9,6)
Missing data	787 (25,9)
Dyspnea	
No	789 (25,9)
Yes	1720 (56,6)
Missing data	532 (17,5)
Respiratory Distress	
No	711 (23,4)
Yes	1733 (57)
Missing data	597 (19,6)
Evolution	
Cure	2091 (72)
Death	60 (2,1)
Missing Data	752 (25,9)

Source: Authors, 2021.

Faced with confirmed cases of COVID-19, the bivariate analyses showed that the chance of older children (six to nine years old) being diagnosed with COVID-19 is 1.33 (CI:1.05-1.69) times higher when compared to younger ones (zero to five years old). A higher chance of reporting cases of COVID-19 was also observed in rural areas (RC=1.96/IC:1.30-2.96) compared to those reported in urban areas; and similarly, a higher chance of COVID-19 notifications for the Northern Regions (RC=3.49/IC:2.52-4.85), followed by the Northeastern Region (RC=1.33/IC:1.03-1.73).

Regarding clinical variables, children diagnosed with COVID-19 were more likely to be admitted to the Neonatal Intensive Care Unit (NICU) (RC=1.46/IC: 1.12-1.87), when compared to other inpatient units. Regarding the symptoms presented, fever (CR=1.27/IC: 1.03-1.58) and sore throat (CR=1.94/IC:1.41-2.66) were more likely to occur in children affected by COVID-19 when compared to those affected by other SARS. In contrast, cough (CR=0.66/IC: 0.50-0.86), dyspnea (CR=0.74/IC:0.58-0.94), and respiratory distress (CR=0.67/IC: 0.53-0.86) were the least prevalent symptoms among children diagnosed with COVID-19 when compared with the other reports. However, the chance of death among children with COVID-19 was seen to be higher (CR= 3.30/IC: 1.92-5.66) when compared to those not affected by the disease (Table 2).

Table 2 - Distribution of variables associated with the diagnosis of COVID-19 in children aged 0 to 9 years. Rio de Janeiro, RJ, Brazil, 2021 (continues)

	Positive Diagnosis for COVID-19		
	N (%)	**CR (CI 95%)***	**p**
Sociodemographic variables			
Gender			

Female	179 (13,7)	1	
Male	235 (13,6)	1,01 (0,83-1,25)	0,985
Age			
0 to 5 years old	303 (12,8)	1	
6 to 9 years old	111 (16,4)	1,33 (1,05-1,69)	0,017
Skin Color			
White	132 (13,3)	1	
Blacks	15 (14,4)	0,91 (0,51-1,62)	0,742
Brunet	208 (14,9)	0,88 (0,70-1,11)	0,274
Notification Area			
Urban	325 (13,2)	1	
Rural	32 (23)	1,96 (1,30-2,96)	0,001
Peri-urban	5 (8,3)	0,60 (0,24-1,50)	0,271
Reporting Region			
Southeast	173 (11,3)	1	
North	67 (30,7)	3,49 (2,52-4,85)	<0,0001
Northeast	103 (14,5)	1,33 (1,03-1,73)	0,032
South	42 (12,2)	1,01 (0,77-1,58)	0,608
Center-West	29 (12,4)	1,12 (0,73-1,70)	0,577
Clinical variables			
Had hospitalization			
No	13 (26,5)	1	
Yes	382 (13,2)	0,42 (0,22-0,80)	0,006
Admitted to ICU			
No	228 (12,1)	1	
Yes	106 (16,7)	1,46 (1,12-1,87)	0,003
Normal X-ray			
Yes	35 (10,5)	1	
No	101 (11,5)	1,11 (0,74-1,66)	0,622
Use of ventilatory support			
No	145 (14,3)	1	
Yes	185 (12,9)	0,89 (0,70-1,12)	0,32
Saturation <95%			
No	134 (14)	1	
Yes	176 (13)	0,92 (0,72-1,17)	0,502
Associated Symptoms			
Fever			
No	74 (10,9)	1	
Yes	280 (14,4)	1,27 (1,03-1,58)	0,022
Cough			

No	84 (17,6)	1	
Yes	275 (12,3)	0,66 (0,50-0,86)	0,002
Sore throat			
No	202 (12,3)	1	
Yes	62 (21)	1,94 (1,41-2,66)	<0,0001
Dyspnea			
No	122 (15,5)	1	
Yes	205 (11,9)	0,74 (0,58-0,94)	0,014
Respiratory discomfort			
No	120 (16,9)	1	
Yes	209 (12,1)	0,67 (0,53-0,86)	0,002
Evolution			
Cure	264 (15,3)	1	
Death	22 (37,1)	3,30 (1,92-5,66)	<0,0001

*Analyses based on Odds Ratios (CR) and respective confidence intervals (95% CI)
Source: Authors, 2021.

Table 3 presents the multivariate analysis between the variables associated with the diagnosis of COVID-19. At the end of the analysis, after the inclusion of block III variables, some factors remained significantly associated with the outcome. This means that these factors were independently associated with the diagnosis of COVID-19, even after adjustments for the other variables in the model. As can be observed for fever (CR=1.53/IC:1.50-2.24) and sore throat (CR=1.74/IC:1.10-2.76) which remained more prevalent in those affected by COVID-19 when compared to the other cases. On the other hand, cough remained significantly less frequent among children with COVID-19 (CR=0.64/IC:0.44-0.93), when compared to the others. Finally, we saw that the chance of death, regardless of other factors, was 4.37 times higher among those affected by COVID-19 when compared with those affected by other SARS.

Table 3 - Multivariate logistic regression for factors associated with the diagnosis of COVID-19 in children aged 0 to 9 years. Rio de Janeiro, RJ, Brazil, 2021 (continues)

Variables	Multivariate logistic regression model - CR (CI 95%)*		
	Block I	Block II	Block III
Age			
0 to 5 years old	1	1	1
6 to 9 years old	1,17 (0,82-1,68)	1,08 (0,75-1,56)	1,11 (0,77-1,61)
Notification Area			
Urban	1	1	1
Rural	1,76 (0,81-3,80)	1,82 (0,83-3,97)	1,60 (0,71-3,60)
Peri-urban	0,73 (0,82-1,68)	1,08 (0,75-1,56)	1,11 (0,77-1,61)
Fever			
No		1	1
Yes		1,50 (1,03-2,18)	1,53 (1,50-2,24)
Cough			
No		1	1
Yes		0,59 (0,41-0,86)	0,64 (0,44-0,93)
Sore throat			
Yes		1	1
No		1,65 (1,05-2,62)	1,74 (1,10-2,76)
Dyspnea			
Yes		1	1
No		0,83 (0,59-1,17)	0,77 (0,54-1,10)
Admitted to ICU			
No			1
Yes			1,27 (0,85-1,90)
Evolution			
Cured			1
Death			4,37 (1,98-9,63)

*Analyses based on Odds Ratios (CR) and respective confidence intervals (95% CI)
Source: Authors, 2021.

DISCUSSION

Faced with the behavior of the new coronavirus infection, it was possible to observe a greater chance of a positive diagnosis for COVID-19 among children aged six to nine years old, living in rural areas, located in the North and Northeast regions of the country, besides noting that fever and sore throat were the clinical manifestations of greater association among children with COVID-19; moreover, a greater chance of being admitted to the ICU and of evolving to death was observed.

In this study, children aged six to nine years old, during the period analyzed, presented a higher chance of having COVID-19, different from an ecological study, which analyzed the epidemiological indicators of children and adolescents affected by COVID-19, showing a higher number of cases among adolescents. A study developed in China, with 2,143 pediatric patients with COVID-19, observed that neonates were more vulnerable to the disease and to the development of the severe type of infection[13].

However, a retrospective cross-sectional study states that, in the face of respiratory infections in children, there is an association between the appearance of infections and the frequency in daycare centers and schools, among those who are assisted in these settings, demonstrating a great risk factor for acquisition, due to the child's exposure to new infectious agents acquired by living with other children, lack of hand hygiene, oral contamination with feces and sharing objects and toys[14]. This may explain the findings of the present study among school-age children with a greater chance of acquiring COVID-19.

The rural residence zone was the one with the highest chance of notifying children with COVID-19, a fact that draws attention because, according to a study[15], this area had the highest lethality among residents, casting a more careful eye on the progression of COVID-19, considering the social inequalities present in this scenario, such as access to health services.

On this aspect, research developed in the United States of America points out that there are increasing signs that the COVID-19 started to spread affecting 84% of rural areas, which ratifies the importance of studies of this nature to monitor the spread of the virus in these spaces, aiming to control the spread among individuals and the collapse of health services. This is because most of these areas lack public health infrastructure, especially at these times when the health system is overloaded and without resources to deal with the sudden influx of patients[15].

Likewise, the North and Northeast regions together added more notifications among children with COVID-19, as evidenced in a study that observed the highest rates of notification of the infant and pediatric population in these regions, together making up 60.6% of cases[16]. In this directive, it is necessary to turn to the situations of social and economic vulnerability existing in Brazil, in relation to the spread and control of COVID-19, since the reality of some populations is directly proportional to the acquisition of diseases, which would not be different in face of the current viral infection[17].

It is known that people who occupy less favored social classes constitute groups of greater social vulnerability and, thus, become more vulnerable to COVID-19[18]. Many of the recommendations instituted by the competent health agencies, such as cleaning hands with soap and water, use of masks and 70% alcohol gel (hand sanitizer), demand additional costs for these groups, which often do not have minimum conditions of basic sanitation and personal hygiene[19]. Therefore, facing the pandemic does not happen homogeneously in all states and federation in Brazil, given the social vulnerabilities not only referring to sanitary conditions, but also structural, cultural, organizational, quality, and access to health services in each territory[20].

Another considerable element facing the behavior of the new coronavirus in children corresponds to the clinical manifestation presented. In this study, it was possible to identify an association between children with COVID-19 and the development of nonspecific signs, such as fever and sore throat. On the other hand, the children had a lower chance ratio of presenting cough, dyspnea, respiratory distress, drop in saturation, altered X-ray, or make use of any type of ventilatory assistance, dissonant to what is postulated in the literature. As evidenced in a study developed with 1,124 children with COVID-19, when it reported that the most prevalent symptom was fever, followed by cough and nasal symptoms (coryza and nasal congestion), besides observing that half of the children were asymptomatic or had mild cases[21].

Dyspnea was pointed out in another study as a common manifestation present in all

cases, followed by fever and cough[22]. In another, the most cited manifestations were cough (48.5%), pharyngeal erythema (46.2%) and fever (41.5%)[23]. Therefore, the comparison of these findings points to a variety of symptoms regarding the clinical implications in children diagnosed with COVID-19, which legitimizes the development of studies of this nature, permeating the recognition of these symptoms to encourage the timely management during the care of children with suspected or confirmed COVID-19.

The reasons for the much lower risk of the severe form in children and the diversity of clinical manifestations presented remain unclear. However, some theories have been raised to explain this phenomenon, including different patterns of immune responses presented by children compared to adults, who are more vulnerable to SARS-CoV-2 infection, developing a cytokine storm often associated with lung damage, resulting in a worse prognosis for these patients. This is different from the picture presented among newborns and children, in which differences in innate and T-cell immunity are shown to be more efficient in eliminating the virus[24].

Another reason for the lower severity of COVID-19 in children may be related to the expression of Angiotensin-converting enzyme 2 (ACE2) in alveolar type I and II epithelial cells. ACE2 appears to be the receptor for SARS-CoV-2 and subsequent viral replication. Therefore, a limited expression of ACE2 in childhood, a period when the lungs are still developing, may be a protective factor for children against severe forms of COVID-19[25]. Furthermore, it is postulated that children present a protective immune system against the disease, besides presenting a milder clinical picture in relation to adults and elderly individuals, which determines the timely and differential diagnosis of COVID-19, or other respiratory syndromes, to control the transmission and mitigate possible aggravations caused in this population segment[26].

It was also possible to find a relationship between the child with COVID-19 and the need for ICU admission. On this aspect, research indicates that the infection in children and adolescents by the SARS-CoV-2 virus, although it is most often characterized by mild manifestations, can result in cases that require hospitalization or even intensive care[19]. A research developed in the Northeast region reveals findings in line with the present study, when it identified that the occupation of ICU beds by neonates and children with COVID-19 exceeded the estimate by three times, and further considers that this issue is related to the precariousness of timely diagnosis for the designated treatment, a fact that would result in the control of infection, the development of complications, and the need for intensive care[27].

Finally, it was possible to identify that child with COVID-19 have a higher chance of evolving to death. Evidence points out that the death rate of children diagnosed with COVID-19 admitted to the ICU was 34.5%, higher than that reported in other studies[28], for example, a study conducted in Paris, with 27 children in critical condition, whose death rate identified was 18.5%[29]. In this directive, the literature considers that the mortality rate, besides being closely related to the underreporting of cases of the disease, may also indicate a consequence of the delay in seeking health care assistance, delaying the initial intensive measures, which would decrease the chance of a fatal evolution[28].

Therefore, it is understood the need for epidemiological studies, capable of shedding light on the uncertainties behind the exact role of the behavior of the new coronavirus infection in children, since the analysis of the information regarding Brazil reveals that, despite being the second with the highest number of cases, the country accounts for only 3.14% of the research on COVID-19 in children[30].

As a limitation, we present the use of secondary data whose filling in the variables in the database can impact the quality of the data recorded and, as a consequence, the absence of information that would help explain the relationships between the variables studied. Moreover, it was not possible to establish causality between COVID-19 and the other factors analyzed, since all the characteristics of the group studied were measured at the same time.

CONCLUSION

This study found that children between six and nine years of age, living in rural areas, located in the North and Northeast regions of the country, are more likely to be infected with the new coronavirus, and found that fever and sore throat were the clinical manifestations of greater association with COVID-19, as well as having a greater chance of evolving to death.

Knowing the epidemiological profile of children facing infection by the new coronavirus contributes to guide and modulate interventions to reduce the magnitude of the epidemic peak of COVID-19, besides mitigating transmission, avoiding the development of the severe form of the disease, hospitalizations, and deaths from this devastating disease. In view of this, it is suggested that policies directed to this age group be intensified regarding identification, diagnosis, and treatment, which makes the development of this type of study capable of understanding and solving doubts of the population and health professionals about the clinical evolution of COVID-19 in children fundamental.

REFERENCES

1. Hillesheim D, Tomasi YT, Figueiró TH, Paiva KM de. Severe Acute Respiratory Syndrome due to COVID-19 among children and adolescents in Brazil: profile of deaths and hospital lethality as at Epidemiological Week 38, 2020. Epidemiol. serv. saúde [Internet]. 2020 [accessed 04 jul 2021]; 29(5). Available from: https://doi.org/10.1590/S1679-49742020000500021.

2. Volpat AT, Gomes EM de S, Cunha ET, Cunha ET, Vilaça HM, Mayrink LB, et al. Multisystemic inflammatory syndrome in children and adolescents with COVID-19: a literature review. J. infect. control. [Internet]. 2020 [accessed 07 jul 2021]; 9(3). Available from: https://jic-abih.com.br/index.php/jic/article/view/330/pdf.

3. Ludvigsson JF. Systematic review of COVID-19 in children shows milder cases and a better prognosis than adults. Acta paediatr. [Internet]. 2020 [accessed 07 jul 2021]; 109(6). Available from: https://doi.org/10.1111/apa.15270.

4. Sociedade Brasileira de Pediatria (SBP). Departamento Científico de Pneumologia. Nota de Alerta. COVID-19 em crianças: envolvimento respiratório [Internet] Rio de Janeiro: Sociedade Brasileira de Pediatria; 2020 [accessed 07 jul 2021]. Available from: https://www.sbp.com.br/imprensa/detalhe/nid/COVID-19-em-criancas-envolvimento-respiratorio/.

5. Sociedade Brasileira de Pediatria (SBP). Departamento Científico de Emergência. Nota de Alerta. Sistematização da assistência de pacientes com COVID-19 no serviço de emergência pediátrica. [Internet] Rio de Janeiro: Sociedade Brasileira de Pediatria; 2020 [accessed 07 jul 2021]. Available from: https://www.sbp.com.br/fileadmin/user_upload/22463c-NA_-Sistematiz_Assist_Covid-19_Serv_EmergPed.pdf.

6. Sociedade Brasileira de Pediatria (SBP). Departamento Científico de Infectologia. Nota de alerta. Síndrome inflamatória multissistêmica em crianças e adolescentes provavelmente associada à COVID-19: uma apresentação aguda, grave e potencialmente fatal. [Internet] Rio de Janeiro: Sociedade Brasileira de Pediatria; 2020 [accessed 07 jul 2021]. Available from: https://www.sbp.com.br/fileadmin/user_upload/22532d-NA_Sindr_Inflamat_Multissistemica_associada_COVID19.pdf.

7. World Health Organization (WHO). WHO Coronavirus disease (COVID-19) dashboard. [Internet] Geneva: World Health Organization; 2020 [accessed 07 jul 2021]. Available from: https://covid19.who.int.

8. Safadi MAP. The intriguing features of COVID-19 in children and its impact on the pandemic. J. pediatr. [Internet]. 2020 [accessed 07 jul 2021]; 96(3). Available from: https://doi.org/10.1016/j.jped.2020.04.001.

9. Li R, Pei S, Chen B, Song Y, Zhang T, Yang W, et al. Substantial undocumented infection facilitates the

rapid dissemination of novel coronavirus (SARS-CoV2). Science [Internet]. 2020 [accessed 15 jul 2021]; 368. Available from: https://doi.org/10.1126/science.abb3221.

10. Barbosa DB, Brandelero ACL, Oliveira V da S, Santos LR dos, Araújo AM, Oliveira ES, et al. Scientometric review of the scientific publications about COVID-19 in children. Residência Pediátrica [Internet]. 2020 [accessed 03 dez 2021]; 2236-6814. Available from: https://doi.org/10.25060/residpediatr-2020.v10n3-408.

11. Cunha GH da, Fontenele MSM, Siqueira LR, Lima MAC, Gomes MEC, Ramalho AKL. Insulin therapy practice performed by people with diabetes in Primary Healthcare. Rev Esc Enferm USP [Internet]. 2020 [accessed 03 dez 2021]; (54). Available from: https://doi.org/10.1590/S1980-220X2019002903620.

12. Política Nacional de Atenção Integral à Saúde da Criança. Portaria n. 1.130, de 5 de agosto de 2015. Institui a Política Nacional de Atenção Integral à Saúde da Criança no âmbito do Sistema Único de Saúde. Ministério da Saúde, 15 ago 2015.

13. Dong Y, Mo X, Hu Y, Qi X, Jiang F, Jiang Z, et al. Epidemiology of COVID-19 Among Children in China. Pediatrics [Internet]. 2020 [accessed 31 jul 2021];145(6). Available from: https://doi.org/10.1542/peds.2020-0702.

14. Antunes J, Chambel M, Borrego LM, Prates S, Loureiro V. Infecções respiratórias virais na criança. Acta. pediatr. port. [Internet]. 2013 [accessed 31 jul 2021]; 44(1). Available from: https://doi.org/10.25754/pjp.2013.611.

15. Paul R, Arif AA, Adeyemi O, Ghosh S, Han D. Progression of COVID-19 from urban to rural areas in the United States: a spatiotemporal analysis of prevalence rates. J. rural health [Internet]. 2020 [accessed 31 jul 2021]; 36(4). Available from: https://doi.org/10.1111/jrh.12486.

16. Neto JC, Feitosa EMS, Silva KVLG da, Oliveira CJ de. Análise de indicadores epidemiológicos de crianças e adolescentes acometidos pela COVID-19 no Nordeste do Brasil. Rev. enferm. UFSM. [Internet]. 2021 [accessed 31 jul 2021]; 11(19). Available from: https://docs.bvsalud.org/biblioref/2021/04/1177620/63043-277337-1-pb.pdf.

17. Bernardino FBS, Alencastro LC da S, Silva RA da, Ribeiro AD do N, Castilho GR de C, Gaíva MAM. Epidemiological profile of children and adolescents with COVID-19: a scoping review. Rev. bras. enferm. [Internet]. 2021 [accessed 31 jul 2021]; 74(Suppl 1). Available from: http://dx.doi.org/10.1590/0034-7167-2020-0624.

18. Nunes J. The COVID-19 pandemic: securitization, neoliberal crisis, and global vulnerabilization. Reports in public health. [Internet]. 2020 [accessed 31 jul 2021]; 36(5). Available from: https://doi.org/10.1590/0102-311X00063120.

19. Gorbalenya AE, Baker SC, Baric RS, Groot RJ de, Drosten C, Gulyaeva AA, et al. The species Severe acute respiratory syndrome-related coronavirus: classifying 2019-nCoV and naming it SARS-CoV-2. Nat microbiol [Internet]. 2020 [accessed 31 jul 2021]; 5. Available from: https://doi.org/10.1038/s41564-020-0695-z.

20. Natividade M dos S, Bernardes K, Pereira M, Miranda SS, Bertoldo J, Teixeira M da G, et al. Distanciamento social e condições de vida na pandemia COVID-19 em Salvador-Bahia. Ciên. saúde coletiva [Internet]. 2020 [accessed 05 ago 2021]; 25(9). Available from: https://www.scielo.br/j/csc/a/kjGcdPcnc3XdB7vzGJjZVzP/?lang=pt.

21. Bezerra JC, Braga HFGM, Melo FM de S, Nascimento AP do, Silva FBB, Melo ESJ. Clinical manifestations presented by children infected with COVID-19: an integrative review. Rev. Eletr. Enferm. [Internet]. 2021 [accessed 05 ago 2021]; 23. Available from: https://www.revistas.ufg.br/fen/article/view/65966/36900.

22. Sun D, Li H, Lu X-X, Xiao H, Ren J, Zhang F-R, et al. Clinical features of severe pediatric patients with coronavirus disease 2019 in Wuhan: a single center's observational study. World j. pediatr. [Internet]. 2020 [accessed 05 ago 2021]; 16(3). Available from: https://doi.org/10.1007/s12519-020-00354-4.

23. Lu X, Zhang L, Du H, Zhang J, Li YY, Qu J, et al. SARS-CoV-2 Infection in children. New engl. j. med. [Internet]. 2020 [accessed 05 ago 2021]; 382(17). Available from: https://www.nejm.org/doi/full/10.1056/nejmc2005073.

24. Sun P, Lu X, Xu C, Sun W, Pan B. Understanding of COVID-19 based on current evidence. J. med. virol. [Internet]. 2020 [accessed 05 ago 2021]; 1(4). Available from: https://doi.org/10.1002/jmv.25722.

25. Sociedade Brasileira de Pediatria (SBP). Departamento de Cardiopatias Congênitas e Cardiologia Pediátrica. Nota de alerta. A criança com cardiopatia nos tempos de COVID-19 – Posicionamento oficial conjunto. [Internet] São Paulo: Sociedade Brasileira de Pediatria; 2020 [accessed 20 jul 2021]. Available from: https://www.sbp.com.br/fileadmin/user_upload/22421b-Nota_Alerta_-_Crianca_Cardiopatia_nos_tempos_COVID-19.pdf.

26. Zimmermann P, Curtis N. COVID-19 in children, pregnancy and neonates: a review of epidemiologic and clinical features. Pediatr infect. dis. j. [Internet]. 2020 [accessed 20 jul 2021]; 39 (6). Available from: https://doi.org/10.1097/INF.0000000000002700.

27. Marinelli NP, Albuquerque LP de A, Sousa IDB de, Batista FM de A, Mascarenhas MDM, Rodrigues MTP. Evolução de indicadores e capacidade de atendimento no início da epidemia de COVID-19 no Nordeste do Brasil, 2020. Epidemiol. serv. Saúde [Internet]. 2020 [accessed 20 jul 2021]; 29(3). Available from: https://www.scielo.br/j/ress/a/XgCV9Kcbqjw5qfDpr6Vs5Dg/?lang=pt&format=pdf.

28. Cavalcante ANM, Tavares LV de S, Bastos MLA, Almeida RLF de. Clinical-epidemiological profile of children and adolescents with COVID-19 in Ceará. Rev. bras. saúde matern. infant. [Internet]. 2021 [accessed 20 jul 2021]; 21(Suppl 2). Available from: http://dx.doi.org/10.1590/1806-93042021005200006.

29. Oualha M, Bendavid M, Berteloot L, Corsia A, Lesage F, Vedrenne M, et al. Severe and fatal forms of COVID-19 in children. Archives de pédiatrie [Internet]. 2020 [accessed 20 jul 2021]; 27(5). Available from: https://doi.org/10.1016/j.arcped.2020.05.010.

30. Sociedade Brasileira de Pediatria (SBP). Departamento Científico de Imunizações e Departamento Científico de Infectologia. Nota Técnica. Dados Epidemiológicos da COVID-19 em Pediatria. [Internet]. 2021 [accessed 20 jul 2021]. Available from: https://www.sbp.com.br/fileadmin/user_upload/22972b-NT_-_Dados_Epidem_COVID-19_em_Pediatria.pdf.

Received: 09/09/2021
Approved: 14/12/2021

Associate editor: Luciana Puchalski Kalinke

Corresponding author:
Dayvanne Pereira Soares da Silva Damasceno
Universidade Federal Fluminense – Rio das Ostras, RJ, Brasil
E-mail: dayvanenit@yahoo.com.br

Role of Authors:
Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work - Damasceno DPS da S, Portela LF, Góes FGB, Martinez EA, Neves G de L; Drafting the work or revising it critically for important intellectual content - Góes FGB, Martinez EA; Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved - Silva ACSS da. All authors approved the final version of the text.

ISSN 2176-9133